

REMARKS

This is intended as a full and complete response to the Office Action dated June 2, 2009, having a shortened statutory period for response set to expire on September 2, 2009. Please reconsider the claims pending in the application for reasons discussed herein.

Claims 1-33 remain pending in the application and are shown above. Claims 1-33 are rejected by the Examiner. Claims 1-20, 22-25, 27-31, and 33 are amended to clarify the invention. Claim 34 has been added.

Claim Rejections Under 35 USC § 112

Claim 33 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

Claim 33 has been amended to include "detecting secondary and/or backscattered particles for imaging the specimen in a measurement" which provides antecedent basis for "repeating the imaging steps" limitation recited in claim 33. Applicants request withdrawal of the 35 U.S.C. 112, second paragraph rejection.

Claim Rejections Under 35 USC § 102

Claims 1-9, 11-19, and 22-30 are rejected under 35 U.S.C. 102(b) as being anticipated by *Kojima* (U.S. Patent No. 6,441,384, hereinafter "*Kojima*").

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Brothers v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). In other words, the elements in the single prior art reference must be "arranged or combined in the same way as in the claim," *Net Money/IN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1370 (Fed. Cir. 2008).

Applicants respectfully assert that independent claims 1, 5, 8, and 25 are not anticipated by *Kojima* under 35 U.S.C. § 102(b) because *Kojima* does not describe each and every element of independent claims 1, 5, 8, and 25. Additionally, the applicants respectfully submit that the elements in *Kojima* are not arranged or combined in the same way as in the independent claims, as required by law.

In particular, *Kojima* does not describe a charged particle beam device having a scan deflector adapted to focus either a multi-area sub-beam charged particle beam or at least two independent charged particle beams onto the same location within the focal plane, as recited in amended independent claims 1, 5, and 8. Furthermore, *Kojima* does not describe an aperture arrangement that forms a multi-area sub-beam charged particle beam with a cross-like shape, as recited in amended independent claim 5. Additionally, *Kojima* does not describe focusing the multi-area sub-beam charged particle beam with an objective lens onto the same location of a specimen for generating a probe on the specimen being an image of a source, a virtual source, or a crossover, as recited in amended independent claim 25.

Kojima teaches a microlithography apparatus (Figure 10) for transferring a pattern (e.g., a circuit pattern), define by a reticle 7, onto a sensitive substrate 5 (e.g., a semiconductor wafer) using a charged particle beam 1. (*Kojima*, 1:5-10, 1:54-67, Figures 1 & 10.) An aperture plate 15 defines the annular aperture 15a and allows passage of the beam having a beam semi-angle within the specified range. (*Id.*, 11:53-58, Figure 10.) The annular aperture 15a may be defined as a substantially donut-shaped opening 15a which are two semicircular annular portions and by multiple circular openings arranged on a bolt-circle BC in the aperture plate 15. (*Id.*, 11:66-12:20, Figures 11 & 12.)

However, *Kojima* fails to teach, show, or suggest a charged particle beam device, including a scan deflector, to focus the sub-beams or independent beams onto the same location. Furthermore, *Kojima* fails to teach, show, or suggest an aperture arrangement that forms a multi-area sub-beam charged particle beam with a cross-like shape. Additionally, *Kojima* fails to teach, show, or suggest, focusing the multi-area

sub-beam charged particle beam with an objective lens onto the same location of a specimen for generating a probe on the specimen being the image of a source, virtual source, or a crossover.

As *Kojima* does not describe a charged particle beam device having an objective lens for focusing the multi-area sub-beam, wherein the charged particle beam device, including the emitter, the aperture arrangement, a condenser lens, and a scan deflector, is adapted to focus the multi-area sub-beam charged particle beam onto the same location within the focal plane for generating a probe on the specimen being an image of a source, a virtual source, or a crossover, as recited in independent claim 1, Applicants assert that claim 1 is not anticipated by *Kojima* and respectfully request that the Examiner withdraw the rejection of independent claim 1 under 35 U.S.C. § 102(b).

Furthermore, as *Kojima* does not describe a charged particle beam device having an aperture arrangement with at least one aperture for blocking a part of the emitted charged particles, wherein the aperture arrangement forms a multi-area sub-beam charged particle beam with a cross-like shape and an objective lens for focusing the multi-area sub-beam charged particle beam with a cross-like shape, wherein the charged particle beam device, including the emitter, the aperture arrangement, a condenser lens, and a scan deflector, is adapted to focus the multi-area sub-beam the same location within the focal plane for generating a probe on the specimen being an image of a source, a virtual source, or a crossover, as recited in independent claim 5, Applicants assert that claim 5 is not anticipated by *Kojima* and respectfully request that the Examiner withdraw the rejection of independent claim 5 under 35 U.S.C. § 102(b).

Additionally, as *Kojima* does not describe a charged particle beam device having an objective lens for focusing the at least two independent charged particle beams, wherein the charged particle beam device, including the emitter, the aperture arrangement, a condenser lens, and a scan deflector, is adapted to focus the at least two independent charged particle beams onto the same location within the focal plane for generating a probe on the specimen being an image of a source, a virtual source, or a crossover, as recited in independent claim 8, Applicants assert that claim 8 is not

anticipated by *Kojima* and respectfully request that the Examiner withdraw the rejection of independent claim 8 under 35 U.S.C. § 102(b).

Additionally, as *Kojima* does not describe a method of operating a charged particle beam device including focusing a multi-area sub-beam charged particle beam with an objective lens onto the same location of a specimen for generating a probe on the specimen being the image of a source, virtual source, or a crossover, as recited in independent claim 25, Applicants assert that claim 25 is not anticipated by *Kojima* and respectfully request that the Examiner withdraw the rejection of independent claim 25 under 35 U.S.C. § 102(b).

Applicants additionally assert that each of dependent claims 2-4, 6-7, 9, 11-19, 22-24 and 26-30 is allowable at least because each depends directly or indirectly from claims 1, 5, 8, and 25, which are allowable for the reasons stated above. Therefore, Applicants assert that claims 2-4, 6-7, 9, 11-19, 22-24 and 26-30 are patentable over *Kojima* and respectfully request that the Examiner withdraw the rejection of dependent claims 2-4, 6-7, 9, 11-19, 22-24 and 26-30 under 35 U.S.C. § 102(b).

Regarding dependent claims 4, 9, 17 and 18, Applicants additionally assert that *Kojima* does not describe an aperture arrangement that forms a multi-area sub-beam charged particle beam with cross-like shape or that the aperture arrangement has a cross-like shape as recited in dependent claims 4, 9, 17, and 18. Therefore, Applicants respectfully request that the Examiner withdraw the rejection of dependent claim 4, 9, 17 and 18 under 35 U.S.C. § 102(b) for this additional reason.

Regarding dependent claim 14, Applicants additionally assert that *Kojima* does not describe at least two apertures that have an elongated shape with a long axis and short axis, wherein the long axis is arranged radially with respect to an optical axis of the charged particle beam device, as recited in dependent claim 14. Therefore, Applicants respectfully request that the Examiner withdraw the rejection of dependent claim 14 under 35 U.S.C. § 102(b) for this additional reason.

Claims 8, 25, and 31 are rejected under 35 U.S.C. 102(b) as being anticipated by *Adamec et al.* (U.S. Patent No. 6,943,349, hereinafter "*Adamec*").

Applicants respectfully assert that independent claims 8 and 25 are not anticipated by *Adamec* under 35 U.S.C. § 102(b) because *Adamec* does not describe each and every element of independent claims 8 and 25. Additionally, the applicants respectfully submit that the elements in *Adamec* are not arranged or combined in the same way as in the independent claims, as required by law.

In particular, *Adamec* does not describe a charged particle beam device, having a scan deflector adapted to focus at least two independent charged particle beams onto the same location within the focal plane, as recited in amended independent claim 8. Additionally, *Adamec* does not describe focusing the multi-area sub-beam charged particle beam with an objective lens onto the same location of a specimen for generating a probe on the specimen being an image of a source, a virtual source, or a crossover, as recited in amended independent claim 25.

The Examiner asserts that *Adamec* teaches a charged particle beam device comprising an emitter (Fig. 1, 2) for emitting charged particles (Fig. 1, 4); an aperture arrangement (Fig. 1, 5) with at least one aperture (Fig. 1, 5A, 5E) for separating the emitted charged particles into at least two independent charged particle beams (Fig. 1, 4A, 4E); and an objective lens (fig. 1, 10) for focusing the at least two independent charged particle beams onto the same location within the focal plane (5:11-15.)

Adamec teaches that it is not feasible to use a conventional (single-beam) Scanning Electron Microscope (SEM) for wafer inspection, since this approach does not provide the required throughput, *Adamec*, 1:40-44, and that there is a need for a charged particle beam device which provides a sufficient resolution and which is able to increase the data collection, *Adamec*, 2:56-58. *Adamec* teaches that multiple charged particle beams 4A-4H are created by passing through the aperture plate 5 and that a deflector 6 is used to influence the beams of charged particles 4A-4H so that each beam 4A-4H appears to come from a different source. (*Id.*, 4:43-47, Figure 1.) The

charged particle beams 4A-4H pass a detector 9, divided into multiple segments 9A-9H, used to detect those particles that come from the specimen 8 in order to produce multiple images of the specimen 8, where the multiple segments 9A-9H correspond to the multiple charged particle beams 4A-4H. (*Id.*, 4:55-60, Figure 1.)

By scanning the charged particle beams 4A-4H over the specimen and displaying/recording the output of the detector 9, multiple independent images of the surface of the specimen 8 are formed. (*Id.*, 5:37-40, Figure 1.) The electron beams 4A and 4C do not hit the specimen at the same spot but are displaced from each other by a distance D and images from the two beams 4A and 4C are recorded by scanning the two beams 4A and 4C over the surface of the specimen. (*Id.*, 8:43-47, Figures 3 & 15.) *Adamec* teaches that due to the deflector, multiple images of the source are created on the surface of the specimen whereby all the images can be used for parallel data acquisition. (*Id.*, Abstract.)

The Examiner asserts that *Adamec* teaches focusing at least two independent charged particle beams onto the same location within the focal plane. However, *Adamec* teaches that due to the combined effects of the deflector 6 and the objective lens 10, multiple spots (images of the particle source 2) are created on the specimen 8, each corresponding to one of the charged particle beams 4A-4H. (*Id.* 5:9-15, Figure 1.) Furthermore, *Adamec* teaches that without the deflector 6, the objective lens 10 would focus the charged particle beams 4A-4H into a single spot on the specimen 8. (*Id.*) Thus, the teaching of *Adamec* in its entirety is not to provide a single spot but to provide multiple spots, unlike the present invention.

Thus, *Adamec* fails to teach, show, or suggest a charged particle beam device having a scan deflector adapted to focus at least two independent charged particle beams onto the same location within the focal plane, as recited in amended independent claims 8. Additionally, *Adamec* does not describe focusing the multi-area sub-beam charged particle beam with an objective lens onto the same location of a specimen for generating a probe on the specimen being an image of a source, a virtual source, or a crossover, as recited in amended independent claim 25.

As *Adamec* does not describe a charged particle beam device having an objective lens for focusing the at least two independent charged particle beams, wherein the charged particle beam device, including the emitter, the aperture arrangement, a condenser lens, and a scan deflector, is adapted to focus the at least two independent charged particle beams onto the same location within the focal plane for generating a probe on the specimen being an image of a source, a virtual source, or a crossover, as recited in independent claim 8, Applicants assert that claim 8 is not anticipated by *Adamec* and respectfully request that the Examiner withdraw the rejection of independent claim 8 under 35 U.S.C. § 102(b).

Additionally, as *Adamec* does not describe a method of operating a charged particle beam device including focusing a multi-area sub-beam charged particle beam with an objective lens onto the same location of a specimen for generating a probe on the specimen being the image of a source, virtual source, or a crossover, as recited in independent claim 25, Applicants assert that claim 25 is not anticipated by *Adamec* and respectfully request that the Examiner withdraw the rejection of independent claim 25 under 35 U.S.C. § 102(b).

Applicants additionally assert that dependent claim 31 is allowable at least because it depends directly from claim 25, which is allowable for the reasons stated above. Therefore, Applicants assert that claim 31 are patentable over *Adamec* and respectfully request that the Examiner withdraw the rejection of dependent claim 31 under 35 U.S.C. § 102(b).

Claim Rejections Under 35 USC § 103

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Adamec et al.* (U.S. Patent No. 6,943,349) as applied to claim 8 above, and further in view of *Ishitani et al.* (U.S. Patent No. 7,186,975, hereinafter "*Ishitani*").

Claims 20, 21, and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Adamec et al.* (U.S. Patent No. 6,943,349) as applied to claim 8

above, and further in view of *Matsuya et al.* (U.S. Patent No. 6,924,488, hereinafter "*Matsuya*").

To establish prima facie obviousness of a claimed invention, all of the claim limitations must be taught or suggested by the prior art. (See MPEP 2143.03, *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA)).

Claims 10, 20, 21, and 32 depend directly or indirectly from claims 8 and 25, and include the elements and limitations recited therein.

As previously discussed herein, the teachings of *Adamec* do not describe, teach, or suggest a charged particle beam device having a scan deflector, adapted to focus at least two independent charged particle beams onto the same location within the focal plane, as recited in amended independent claim 8. Additionally, *Adamec* does not describe, teach, or suggest focusing the multi-area sub-beam charged particle beam with an objective lens onto the same location of a specimen for generating a probe on the specimen being an image of a source, a virtual source, or a crossover, as recited in amended independent claim 25.

The teachings of *Ishitani* and *Matsuya* do not satisfy the deficiencies of *Adamec*.

Ishitani teaches a scanning electron microscope having an electron gun 1, an acceleration lens 3, and a focusing lens 4 and objective lens 6 for focusing a beam 2 on a sample 8. (*Ishitani*, 4:36-40, Figure 1.) The focused beam is then scanned on the sample by a deflector 7, and the secondary electron 9 emitted from the sample is detected by a secondary-electron detector 10, where an aperture body 11 for limiting the focused beam is located between deflector 7 and electron gun 1. (*Id.*, 4:40-45, Figure 1.)

Matsuya teaches a charged-particle beam instrument with an aberration corrector comprising four stages of electrostatic quadrupole elements, two stages of magnetic quadrupole elements, and four stages of electrostatic octopole elements. (*Matsuya*, Abstract.)

However, *Ishitani* and *Matsuya* fails to teach, show, or suggest, a charged particle beam device having a scan deflector adapted to focus at least two independent charged particle beams onto the same location within the focal plane, as recited in amended independent claim 8. Additionally, *Ishitani* and *Matsuya* fails to teach, show, or suggest focusing the multi-area sub-beam charged particle beam with an objective lens onto the same location of a specimen for generating a probe on the specimen being an image of a source, a virtual source, or a crossover, as recited in amended independent claim 25.

Thus, combination of *Adamec*, *Ishitani*, and *Matsuya* fails to teach, show, or suggest a charged particle beam device having an objective lens for focusing the at least two independent charged particle beams, wherein the charged particle beam device, including the emitter, the aperture arrangement, a condenser lens, and a scan deflector, is adapted to focus the at least two independent charged particle beams onto the same location within the focal plane for generating a probe on the specimen being an image of a source, a virtual source, or a crossover, as recited in independent claim 8.

Additionally, combination of *Adamec*, *Ishitani*, and *Matsuya* fails to teach, show, or suggest a method of operating a charged particle beam device including focusing a multi-area sub-beam charged particle beam with an objective lens onto the same location of a specimen for generating a probe on the specimen being the image of a source, virtual source, or a crossover, as recited in independent claim 25.

As combination of *Adamec*, *Ishitani*, and *Matsuya* fails to teach, show, or suggest each of the limitations of independent claims 8 and 25, Applicants respectfully assert that dependent claims 10, 20, 21, and 32 would not have been obvious to one of ordinary skill in the art at the time the invention was made, and request that the Examiner withdraw the rejection of dependent claims 10, 20, 21, and 32 under 35 U.S.C. § 103(a).

Conclusion

In conclusion, the references cited by the Examiner, alone or in combination, do not teach, show, or suggest the invention as claimed.

Having addressed all issues set out in the office action, Applicant respectfully submits that the claims are in condition for allowance and respectfully requests that the claims be allowed.

Respectfully submitted,



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